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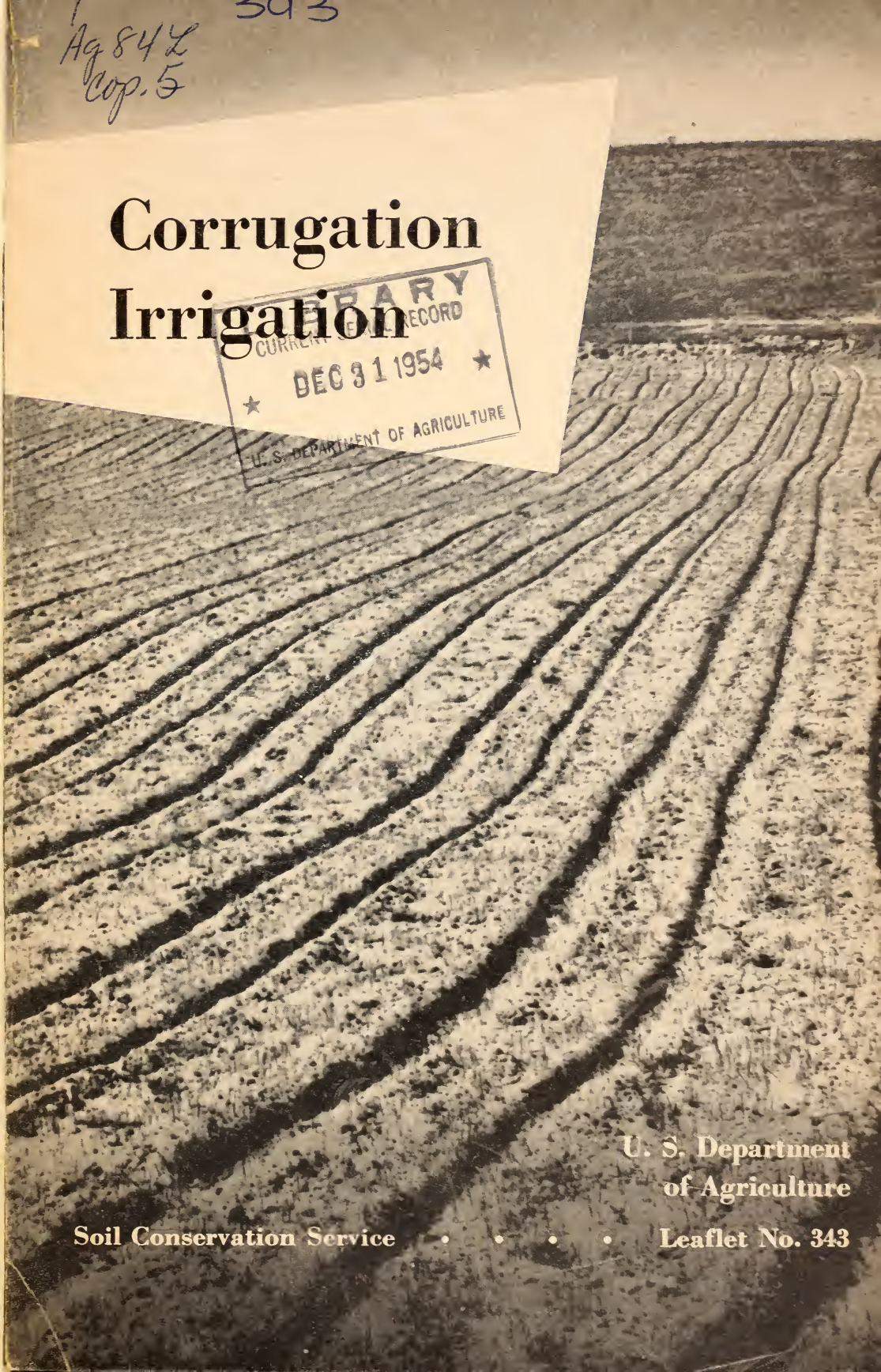

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CORRUGATION IRRIGATION

By WILLIAM R. STANLEY, *engineering specialist, Soil Conservation Service*

CORRUGATION IRRIGATION is used widely in many parts of the West. With this method you irrigate close-growing crops with small streams of water running in V-shaped furrows or corrugations. The water soaks into the soil along the corrugations and spreads out sideways into the areas between them. Corrugations are generally smaller than the furrows used in irrigating cultivated row crops.

With corrugations you can get good irrigation with a water supply that varies during the irrigation season. It is one of the least expensive irrigation methods to install and is often used on new lands that have had little leveling or other preparation work.

Control of irrigation water is the key to conservation irrigation. With corrugations you can control the water on steep or rough land. Since corrugations are used for noncultivated crops, they can be spaced so that the areas between them are wetted without much loss of water from deep percolation.

Proper use of irrigation water results in better crop yields. Too much water leaches plant food from the soil and may cause erosion and drainage problems. The results are lower yields and a lower value of your farm.

Several methods of applying irrigation water give good control. Before selecting your irrigation method, consider the slope of your fields and the ability of your soils to absorb and hold water. Also, learn the depth your crops will root and the amount of water they need. The methods used by your neighbors are not necessarily best for your soils, crops, and water supply. Make sure you select methods that fit your own farm.

WHERE CAN CORRUGATION IRRIGATION BE USED?

Corrugation irrigation is well adapted for the irrigation of medium- and heavy-textured soils.

If fields have a tendency to bake, they are difficult to irrigate by flood methods. Flooding causes the soils to puddle and run together, which results in a hard crust after the surface dries. The crusting may retard plant growth. Applying water through corrugations will correct this condition, since the water "subs" across under the surface between the corrugations and does not puddle the soil.

Even with corrugations, heavy soils are difficult to irrigate because they take water very slowly. Silt loams and fine sandy loams, the easiest soils to irrigate, respond very well to irrigation by the corrugation method because the movement of the water is fairly uniform both sideways and downward.

Corrugation irrigation is not recommended for soils that are very sandy. These soils take water rapidly, and the movement of water is mainly downward. Sideways movement between the corrugations is slow and much water may be wasted below the crop root zone before the area between corrugations is irrigated.

Also, the corrugation method is not recommended for soils having high concentrations of alkali salts. Flooding methods are better. The "subbing" action of corrugations will tend to take the salts into solution and move them toward the surface, causing even heavier concentrations of these salts.

Figure 1.—**Corrugations are sometimes used to supplement border irrigation.**

The corrugation method is well adapted for irrigating land that is steep or irregular. Often, new land may be cleared and put into production the first year. The cost of leveling and the delay in time before planting may be largely eliminated. But, your fields will produce more with less labor if they are graded to smooth out the high and low areas.

On slopes steeper than 5 percent, float leveling alone may be enough. On land under 5 percent, you may need to use a scraper to grade the more irregular areas before using the float leveler. When the field is properly smoothed, crops are not drowned out in the low areas while slightly higher areas are left dry. The corrugations carry the water uniformly to all parts of the field.

Corrugation irrigation may be used to irrigate most close-growing noncultivated crops. Usually, the corrugations are made, as the final tillage operation, after the field has been seeded. Forage crops such as alfalfa, clover, and grasses are watered by this method. Wheat, oats, and barley are commonly irrigated with corrugations. This is also a practical and safe method for irrigating your fields before seeding a crop. Corrugations may be used to get new pasture seedings started. After the plants are large enough to shade the ground and the root system is well enough along to keep the soil from washing, some method of flooding can be used to apply the irrigation water.

The corrugation method also is used for the first irrigation of grain or hay crops that are later to be irrigated by the border method (fig. 1). (See Leaflet 297, Border Irrigation.) Light corrugations are run parallel to the borders to distribute the water without damaging the crop.

The corrugation method can be used with all of the ordinary systems of water delivery. If your water supply consists of a small continuous flow, you can turn it into a few corrugations until they are irrigated and then move to a new group of corrugations. If you have a large flow delivered at intervals, you can "set" more corrugations and irrigate your field more rapidly. If your supply varies from time to time, you can set just the number of corrugations you can properly irrigate with the available water.

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LAYOUT FOR CORRUGATION IRRIGATION

When you lay out a field for corrugation irrigation, you will need to space the head ditches so that the runs will not be too long. In general, runs should be short enough to permit the water to reach the end of the corrugations in about one-fourth the time needed to complete the irrigation. The stream used must, of course, be limited to a flow that will not cause erosion in the corrugation. Table 1 is a general guide for the best lengths of run. When runs are too long the upper end of the field is irrigated too long, and water is wasted below the crop root zone. Also, the lower end of the field, generally, does not get enough water.

If your field has a fairly uniform slope, the length of run may be uniform. But, if your field has definite changes in grade, you should usually locate a head ditch at the beginning of each major slope change (fig. 2). These ditches are needed even though they may cause rather short runs. It is generally not possible to get an even distribution of water unless grades within the length of run are reasonably uniform. Major changes in grade within a run may cause erosion.

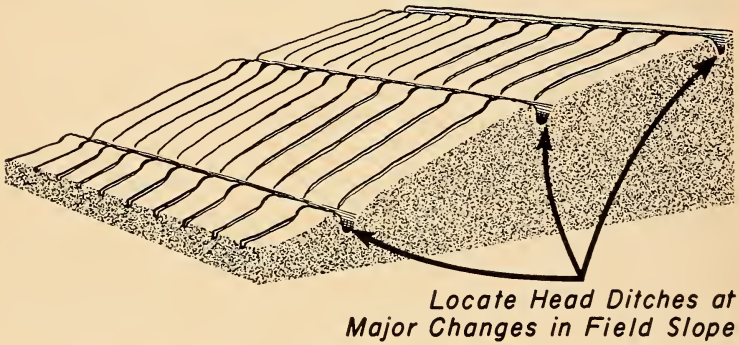

Figure 2.—**In corrugation irrigation, usually there should be a head ditch located at each major change in field slope.**

Major changes in soils may also limit length of runs.

Corrugations should usually be laid out to run directly down the slope. On rolling uneven land this may not always be possible. On these fields, corrugations should be laid out to fit the general, or average, slope. Part of the corrugations may then run slightly across the slope. Where the land slope across the corrugations (cross slope) is more than about 3 percent (3 feet per hundred), you should change the direction of irrigation. It is sometimes possible to avoid too much cross slope by curving the corrugations to fit the land. Often, however, it is necessary to lay out another head ditch and change the direction of irrigation for part of the field.

HOW ARE CORRUGATIONS MADE?

Corrugations can be made with several types of machines. Sled-type corrugators (fig. 3) with two or more runners are often used on the light-textured soils. Wheel machines with shovel corrugation openers can be used on all kinds of soil.

Wooden sled-type corrugators can be made from material commonly found around the farm. Their major cost will be for shop labor. These home-

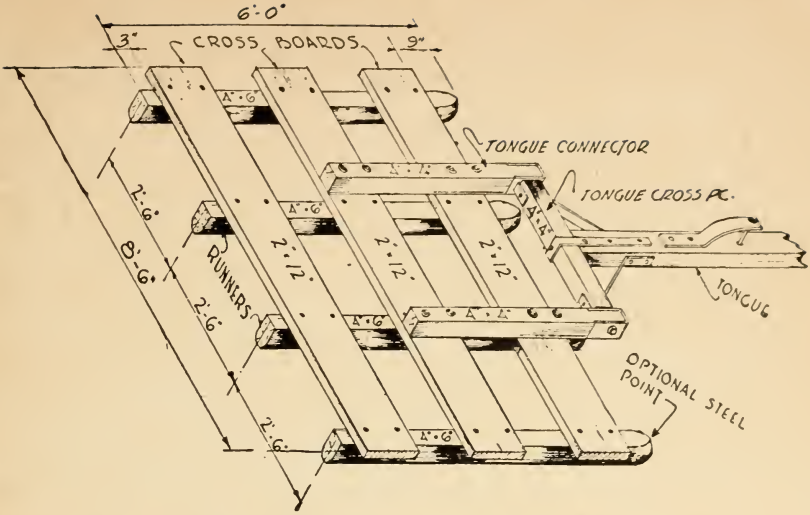

***Figure 3.*—A shop-built sled-type corrugator with four runners.**

made units will do a good job on sandy or friable medium-textured soils. They should not be used on heavy soil, however. Also, they are not easily moved around the farm, and adjustment of corrugation spacing is difficult.

Shovel-type, all-metal corrugators may be purchased (fig. 4). These machines are mounted on wheels and are easily moved from field to field. Wheels or metal runners are sometimes placed back of the shovels to pack the furrows. Most manufactured corrugators can be adjusted for depth and spacing of corrugations. Also, these machines will not disturb growing crops as much as the sled-type.

Table 1.—*Recommended length of run and spacing of corrugations*

Slope (percent)	Heavy-textured clay soils		Medium-textured loam soils		Light-textured sandy soils	
	Length	Spacing	Length	Spacing	Length	Spacing
	Feet	*Inches*	*Feet*	*Inches*	*Feet*	*Inches*
Deep-Rooted Crops on Deep Soil						
2	575	24	425	24	225	18
4	400	21	300	24	150	18
6	300	18	250	21	125	15
8	275	18	200	18	100	15
10	250	18	175	18	...	...
Shallow-Rooted Crops or Deep Soils						
2	400	21	300	21	150	15
4	275	18	200	18	100	15
6	225	18	175	15	...	...
8	200	15	150	15	...	...
10	175	15	125	15	...	...

Figure 4.—**A manufactured shovel-type corrugator with wheels placed back of the shovels to pack the corrugations.**

The spacing and depth of corrugations are not the same for all fields. They vary with the kind of soil and the slope of the land. Table 1 shows the recommended spacing and depth for soils and slopes commonly irrigated with corrugations.

The spacing, or distance between corrugations, depends on the rate water moves sideways into the area between them. Corrugations should be spaced so that the area between them is irrigated by the time the water has moved down through the root zone. Medium-textured soils usually have the best lateral water movement in relation to downward movement. Corrugations on these soils, therefore, can be spaced farther apart than on either light- or heavy-textured soils. On all soils, as slopes increase, space between corrugations should be decreased.

Corrugations are usually about 3 to 5 inches deep. Since water moves down through light-textured sandy soils rapidly, the corrugations must be shallow so that lateral movement will start very near the field surface. Deeper ones may be used on the heavier soils. It is important to make them deep enough to keep the water from breaking out. Rough, poorly leveled fields or fields irrigated slightly across the slope require deeper corrugations.

HEAD-DITCH CONTROL FOR CORRUGATION IRRIGATION

To do a good job of irrigation it is necessary to carefully regulate the amount of water delivered to each corrugation.

One way to regulate the flow is by using siphon tubes (fig. 5). The siphons discharge directly from the head ditches into the corrugations. Some metal siphons have gates across one end to regulate the amount of flow. Other siphons are made of plastic in various diameters so that one or more tubes may be used per corrugation.

You can also regulate the flow to the corrugations by constructing level equalizing basins (figs. 6 and 7) directly below the head ditch.

The equalizing basins are fed from the head ditch. Wood or metal spiles with slide gates are often used to regulate the flow into these basins. The basins should be long enough to supply water to 10 to 20 corrugations.

Figure 5.—**Siphon tubes carry water from the head ditch to the individual corrugations. The irrigator is filling one of the siphon tubes.**

The depth of water in the basins should be controlled by some type of overflow weir discharging into the next lower basin.

The individual corrugations are fed from the equalizing basins. Lath spiles, plastic or metal pipes, metal V-notch weirs, or paper tubes can be used to control the rate of flow from the basins into the corrugations. Canvas, heavy paper, burlap, or grass-sod protected openings can also be used. Earth must be well tamped around each spile, pipe, or tube running through the ditchbank. If you have difficulty with spiles washing out, a small strip of burlap wrapped around each will help keep them in place.

Controls for flows into the corrugations can be set at the proper grade by filling the equalizing basin up to about the desired level for the bottom of the opening. The controls are then placed at, or slightly above, the water line.

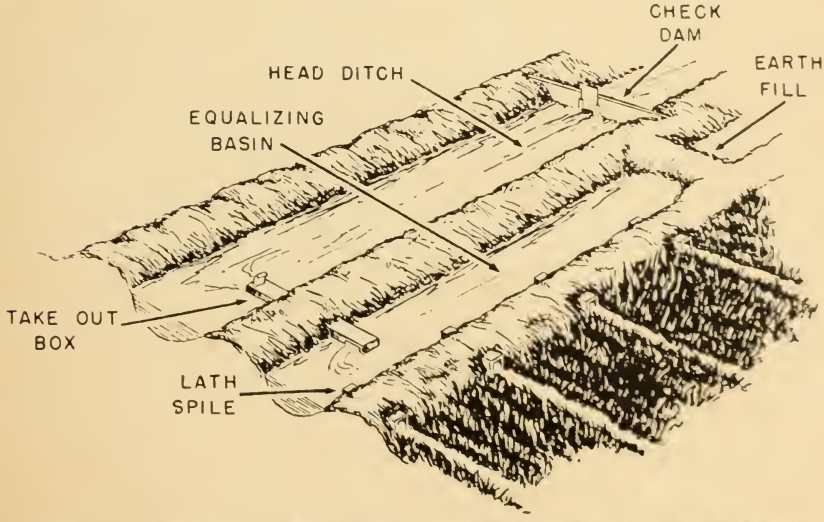

Figure 6.—**Diagram of head ditch, equalizing basin, and spile layout.**

Figure 7.—**An equalizing basin with spiles letting the water into corrugations. Gates at the end of the spiles control the amount of water flowing into them.**

HOW TO APPLY WATER WITH CORRUGATIONS

You should "set" your corrugations with the largest flow they will safely carry and get the water to the lower end of the run in a short time. The water then has a chance to soak into the soil uniformly, and the lower part of the field will get as good an irrigation as the upper part. The amount of water that can be turned into a corrugation depends on the soil, the slope, and the crop. The limiting factor will be erosion in the corrugation. Do not use streams that cause soil movement. When the water reaches the lower end of the run, reduce the irrigation stream to keep the waste at the end of the corrugation to a small fraction of the amount turned in.

Smaller streams and special care by the irrigator will be required on the steeper slopes to prevent erosion and water loss. Allow water to flow in the corrugation for only the time required to penetrate the root-zone of the plants. Use a shovel, or soil auger, to check the moisture condition of the soil before irrigating and during the time water is being applied.

HOW TO MAINTAIN CORRUGATIONS

You must keep corrugations open if they are to function properly. Plugged corrugations cause the water to break over, thus increasing the flow in adjoining corrugations. This may cause serious erosion in your fields. Harvesting operations tend to plug the corrugations on hay lands. You may need to remake them each year before the first irrigation.

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